

**2018**

Full Marks - 60

Time - 3 hours

The questions are of equal value

Answer *all* questions selecting either {(a),(b)}  
or {(c),(d)} from each question

1. a) Describe the various contributions made by P. Maheswari in plant embryology. 8
- b) Write short notes on the following :
- i) Contributions of W.A. Jensen
  - ii) Contributions of G.B. Amici.

OR

- c) Which phenomenon was discovered by Nawaschin ? Describe the phenomenon. Add a note on its importance in plant life. 8
- d) Write short notes on the following : 4+4
- i) Contributions of B.M. Johri
  - ii) Contributions of W. Hofmeister.

[ 2 ]

2. a) Give an account of microsporogenesis in angiosperm. 8
- b) Write short notes on the following : 2+2
- i) Pollinia
  - ii) NPC system.

OR

- c) Give an account of the development of male gametophyte in angiosperms. 8
- d) Write short notes on the following : 2+2
- i) Callose and its significance
  - ii) Tapetum.
3. a) Give an account of different types of endosperm found in angiosperms. Add a note on the functions of endosperm. 8
- b) Write short notes on the following : 2+2
- i) Obturator
  - ii) Suspensor.

OR

[ 3 ]

- c) Describe the development of monosporic embryo sac with suitable example. 8
- d) Write short notes on the following : 2+2
- i) Nutrition of embryo
  - ii) Helobial endosperm.
4. a) Describe the various methods to overcome self-incompatibility. 8
- b) Write short notes on the following : 2+2
- i) Dry and wet stigma
  - ii) Entomophily.

OR

- c) What are cybrids ? Describe the various processes for obtaining cybrid. Add a note on its importance. 8
- d) Write short notes on the following : 2+2
- i) Significance of pollination
  - ii) GSI.

5. a) Describe the process of *Agrobacterium*-mediated gene transfer. 8
- b) Write short notes on the following : 2+2
- i) Causes of apomixis
  - ii) Role of polyembryony in horticulture.

OR

- c) Describe various types of seed dispersal with suitable examples. 8
- d) Write short notes on the following : 2+2
- i) Biolistic
  - ii) Causes of Polyembryony.

2018

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Answer *all* questions selecting either {(a),(b)}  
or {(c),(d)} from each question

1. a) What is ascent of sap ? What theories are proposed to explain ascent of sap. 8
- b) Write short notes on the following : 2 × 2
- i) Pressure-flow model
  - ii) Components of water potential.

OR

- c) Give an account of experimental evidence in support of phloem as the site of sugar translocation. Add a note on phloem loading and unloading. 8
- d) Write notes on the following : 2 × 2
- i) Symplast Vs. apoplast
  - ii) Stomatal movement.

[ 2 ]

2. a) Explain with suitable example the role of minerals in plant growth and development. 8
- b) Write short notes on the following : 2 × 2
- i) Hydroponics and its advantages
  - ii) Nitrogen deficiency in plants.

OR

- c) What do you understand by macro- and micro-nutrients ? How they are classified. 8
- d) Write short notes on the following : 2 × 2
- i) Necrosis Vs. Chlorosis
  - ii) Chelating agents.
3. a) Describe briefly different methods of nutrient uptake in plants. 8
- b) Write short notes on the following : 2 × 2
- i) Proton pump
  - ii) Soil as nutrient reservoir.

OR

- c) Give an account of proton ATPase pump. Explain its functional role. 8

[ 3 ]

- d) Write short notes on the following :  $2 \times 2$
- Active Vs. Passive absorption
  - Symport Vs. antiport.
4. a) Describe how auxin was discovered. Write its chemical nature, assay and physiological role. 8
- b) Write short notes on the following :  $2 \times 2$
- Structure and function and Brassinosteroids
  - Role of Ethylene in plants.
- OR
- c) Give an account of the discovery, structure and physiological role of gibberellins. 8
- d) Write short notes on the following :  $2 \times 2$
- Bioassay of Auxin
  - Jasmonic acid.
5. a) Describe photoperiodism. Explain how photoperiodism plays important role in the flowering process. 8

[ 4 ]

- b) Write short notes on the following :  $2 \times 2$
- i) Phytochrome
  - ii) Seed dormancy.

OR

- c) Explain LER and HIR mode of operation of Phytochrome. 8
- d) Write short notes on the following :  $2 \times 2$
- i) Florigen
  - ii) Role of red light and far-red light in plants.



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Answer *all* questions

1. a) Define plant breeding. Discuss its aim and objectives with suitable examples. 8
- b) Write notes on the following : 2+2
- i) Emasculation
  - ii) Pure line selection.

OR

- c) Describe molecular breeding with its merits and demerits with examples. 8
- d) Write notes on the following : 2+2
- i) Mass Selection
  - ii) Bragging.

2. a) What do you mean by plant introduction and acclimatization ? Describe the steps involved in plant introduction. 8

b) Write notes on the following : 2+2

i) Composite cross

ii) Pedigree method.

OR

c) What is Hybridization ? Write the different hybridization methods for self and cross-pollinated crops. 8

d) Write notes on the following : 2+2

i) Centres of origin

ii) Crop domestication.

3. a) Describe the concept and mechanism of quantitative inheritance with example. 8

b) Write notes on the following : 2+2

i) Polygenic inheritance

ii) Incomplete dominance.

OR

- c) Give some examples of recessive and dominant traits. Describe the mechanism of inheritance of these traits. 8
- d) Write notes on the following : 2+2
- i) Monogenic inheritance
  - ii) Pleiotrophy.
4. a) What is Heterosis ? Discuss the genetical theories to explain effect and causes of heterosis. 8
- b) Write notes on the following : 2+2
- i) Cytoplasmic Male sterility
  - ii) Luxuriance.

OR

- c) Define inbreeding depression. Briefly describe its main features and give a brief account of the various degrees of in-breeding depression found in different crops. 8

[ 4 ]

- d) Write notes on the following : 2+2
- i) Hybrid Vigour
  - ii) Over dominance.
5. a) Describe the molecular basis of gene mutation with examples. 8
- b) Write notes on the following : 2+2
- i) Allopolyploidy
  - ii) Distant hybridisation.

OR

- c) Give a detail account of role of Biotechnology in crop improvement with a suitable example. 8
- d) Write notes on the following : 2+2
- i) Autopolyploidy
  - ii) Chemical mutagens.

**2018**

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Answer *all* questions

1. a) Define natural resources and describe the different types of natural resources. 8
- b) Write short notes on the following : 2 × 2
  - i) Sustainable development
  - ii) Importance of natural resources.

OR

- c) What is sustainable utilization of natural resources and describe different approaches for conservation and sustainable use of natural resources. 8
- d) Write short notes on the following : 2 × 2
  - i) Economic approach of sustainable utilization
  - ii) Types of mineral resources.

[ 2 ]

2. a) Describe different utilization of lands as natural resource. 8
- b) Write short notes on the following : 2 × 2
- i) Groundwater recharge
  - ii) Estuarines.

OR

- c) Describe how to conserve the fresh water and its management strategies. 8
- d) Write short notes on the following : 2 × 2
- i) Soil degradation and management
  - ii) Marine water management strategies.
3. a) What are biodiversity types. Describe the threats and management strategies to conserve the biodiversity. 8
- b) Write notes on the following : 2 × 2
- i) Forest bioresources
  - ii) IPR.

OR

[ 3 ]

- c) Describe different types of forest of India and their significance. What are the management strategies to prevent forest depletion. 8
- d) Write notes on the following : 2 × 2
- i) Bioprospecting
  - ii) National biodiversity action plan.
4. a) Explain different renewable sources of energy and how to utilize these energy for sustainable development. 8
- b) Write notes on the following : 2 × 2
- i) GIS
  - ii) Carbon footprint.

OR

- c) Describe various types of contemporary practices in natural bio-resource management. 8
- d) Write short notes on the following : 2 × 2
- i) Non-renewable sources of energy
  - ii) EIA.

[ 4 ]

5. a) Explain the national and international efforts in resource management and conservation. 8
- b) Write short notes on the following : 2 × 2
- i) CBD
- ii) Waste Water Management.

OR

- c) What is resource accounting. Explain different waste management strategies to conserve bioresources. 8
- d) Write short notes on the following : 2 × 2
- i) National approaches for bioresource conservation
- ii) Participatory resource appraisal.



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Answer *all* questions, selecting either {(a), (b)} of  
{(c), (d)} from each.

1. a) Describe the contributions of E. Strasburger for the field of plant embryology. 8
- b) Write short notes on the following : 2 + 2
- i) Scope of plant embryology.
- ii) Contributions of J. Heslop-Harrison.

OR

- c) Discuss the various contributions of P. Maheswari in the field of plant embryology. 8
- d) Write short notes on the following : 2 + 2
- i) Contribution of B.M. Johri.
- ii) Contribution of G. B. Amici.

[ 2 ]

2. a) Write an essay on the scope and application of palynological studies. 8
- b) Write short notes on the following : 2 + 2
- i) Structure of anther wall
  - ii) MGU (Male Germ Unit).

OR

- c) What is NPC system ? Give an account of NPC system and its significance. 8
- d) Write short notes on the following : 2 + 2
- i) Pollen proteins
  - ii) Polyads.
3. a) Describe organization and ultrastructure of a mature embryo sac. 8
- b) Write short notes on the following : 2 + 2
- i) Endothecium
  - ii) Ruminant endosperm.

OR

[ 3 ]

- c) Discuss the development of a typical dicot embryo. 8
- d) Write short notes on the following : 2 + 2
- i) Aril
  - ii) Orthotropous Ovule.
4. a) Give an account of the structure of stigma and style. 8
- b) Write short notes on the following : 2 + 2
- i) Bud pollination
  - ii) Autogamy.

OR

- c) What is heteromorphic self incompatibility ? Discuss different types and the mechanism. 8
- d) Write short notes on the following : 2 + 2
- i) Cybrid
  - ii) Syngamy.

[Turn Over

[ 4 ]

5. a) What is polyembryony ? Write a brief account on classification of polyembryony and its causes and significance. 8
- b) Write short notes on the following : 2 + 2
- i) Electrofusion
  - ii) Seed structure.

OR

- c) What is Germline transformation ? Discuss in brief various methods of germline transformation in plants. 8
- d) Write short notes on the following : 2 + 2
- i) Application of apomixis.
  - ii) Hydrochory.

□□

2019

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Time - 3 hours

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Answer *all* questions

1. a) Describe the mechanism of stomatal movement. 8
- b) Write short notes on the following : 2 + 2
- i) Source-sink relationship.
- ii) Aquaporins.

OR

- c) What is phloem transport ? Describe the pressure flow model to explain the mechanism of phloem transport. 8
- d) Write short notes on the following : 2 + 2
- i) Guttation
- ii) Cohesion-tension theory.

[ 2 ]

2. a) Give an account of methods of study and use of nutrient solution. 8
- b) Write short notes on the following : 2 + 2
- Criteria of essentiality of elements.
  - Deficiency symptoms of Nitrogen.

OR

- c) Describe the role of any five essential elements. 8
- d) Write short notes on the following : 2 + 2
- Beneficial elements
  - Hydroponics.
3. a) Give an account of transport of ions across cell membrane. 8
- b) Write short notes on the following : 2 + 2
- Soil as nutrient pools
  - Carriers.

OR

[ 3 ]

- c) Describe briefly the mechanism of proton ATPases pump and ion flux. 8
- d) Write short notes on the following : 2 + 2
- i) Co-transport
  - ii) Electrochemical gradient.
4. a) Describe the discovery, occurrence and movement of cytokinins. 8
- b) Write short notes on the following : 2 + 2
- i) Apical dominance.
  - ii) Role of ABA to environmental stress.

OR

- c) Describe the physiological effects of Jasmonic acid and brassinostereoids. 8
- d) Write short notes on the following : 2 + 2
- i) Discovery of Gibberellins
  - ii) Chemical structure and occurrence of ethylene.

5. a) Describe briefly the chemical nature and mode of action of phytochrome. 8
- b) Write short notes on the following : 2 + 2
- i) Long day plants
  - ii) Low energy responses.

OR

- c) What is florigen concepts ? Describe its role in stimulating Flowering in different types of photoperiod sensitive plants. 8
- d) Write short notes on the following : 2 + 2
- i) Vernalin
  - ii) Significance of seed dormancy.



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Answer *all* questions

1. a) What is natural resources ? Write an essay on energy resources. 8
- b) Write short notes on the following : 2 + 2
- i) Threat to genetic diversity
- ii) Concept of sustainable utilization.

OR

- c) Describe briefly different approaches for sustainable utilization. 8
- d) Write short notes on the following : 2 + 2
- i) Deforestation
- ii) Biological realms.

[ 2 ]

2. a) Describe different methods of soil degradation and its management. 8
- b) Write short notes on the following : 2 + 2
- i) Watershed
  - ii) Groud water recharge.

OR

- c) Describe how to conserve marine water and its management strategies. 8
- d) Write short notes on the following : 2 + 2
- i) Wetlands
  - ii) Agricultural utilization of land.
3. a) Define biodiversity. How can you classify biodiversity. Discuss the importance of biodiversity. 8
- b) Write short notes on the following : 2 + 2
- i) CBD
  - ii) Minor forest products.

OR

[ 3 ]

- c) Describe different strategies for management of depletion of forest in India. 8
- d) Write short notes on the following : 2 + 2
- i) Hot-spot of biodiversity
  - ii) IPR.
4. a) Define a resource ? Differentiate between renewable and non-renewable resources. 8
- b) Write short notes on the following : 2 + 2
- i) EIA
  - ii) Participatory Resource appraisal.

OR

- c) Describe briefly ecological foot print with ephasis on carbon foot print. 8
- d) Write short notes on the following : 2 + 2
- i) Wind energy
  - ii) Conservation of resources.

[ 4 ]

5. a) What is resource accounting ? Describe different strategies for waste management. 8
- b) Write short notes on the following : 2 + 2
- i) World conservation strategy
  - ii) IUCN.

OR

- c) Describe different international efforts in resource management and conservation. 8
- d) Write short notes on the following : 2 + 2
- i) Biosphere reserve
  - ii) UNEP.

2019

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Time - 3 hours

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Answer *all* questions

1. a) Briefly describe the various modes of reproduction prevalent in crop plant and their significance in plant breeding. 8
- b) Write notes on the following : 2 + 2
- i) Anthesis
- ii) Objectives of plant breeding.

OR

- c) Describe important achievements and undesirable consequences of plant breeding. 8
- d) Write notes on the following : 2 + 2
- i) Domestication
- ii) Future prospects of plant breeding.

2. a) Discuss methods of different types of selection of crop improvement programme with special reference to cross Pollinated crop plants. 8
- b) Write notes on the following : 2 + 2
- i) Acclimatization
  - ii) Plant genetic resources.

OR

- c) What is plant introduction ? Describe Vavilov's centres of origin and domestication for crop plants. 8
- d) Write notes on the following : 2 + 2
- i) Test cross
  - ii) Advantages of hybridization.
3. a) Discuss the mechanism of quantitative inheritance with suitable examples. 8
- b) Write notes on the following : 2 + 2
- i) Mutiple factor hypothesis
  - ii) Monogenic inheritance.

OR

- c) Discuss the mechanism of inheritance of skin colour in human beings. 8
- d) Write notes on the following : 2 + 2
- i) Kernel colour in wheat
  - ii) Polygenic inheritance.
4. a) Describe the genetic consequences of Inbreeding. 8
- b) Write notes on the following : 2 + 2
- i) Application of heterosis
  - ii) Overdominance.

OR

- c) Discuss the physiological and molecular basis of heterosis. 8
- d) Write notes on the following : 2 + 2
- i) Hybrid vigour
  - ii) Sickle cell anaemia.

[ 4 ]

5. a) Give a detail account of role of polyploidy in crop improvement. 8

2 + 2

b) Write notes on the following :

i) Autopolyploidy

ii) Distant hybridization.

OR

c) Discuss the role of biotechnology in crop improvement. 8

d) Write notes on the following : 2 + 2

i) Role of mutation in crop improvement

ii) Gamma Garden.



2020

Full Marks - 60

Time - 3 hours

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Answer *all* questions

1. a) Explain the mechanism of ascent of sap in plants. 8
- b) Write short notes on the following : 2 + 2
- i) Phloem loading
- ii) Water potential.

OR

- c) Describe the process of translation of solutes in plants. 8
- d) Write short notes on the following : 2 + 2
- i) Antitranspirant
- ii) Symplast.

2. a) What are essential elements in plant nutrients ? Explain the role of any three of them and show how their deficiency affects the plant growth .8

b) Write short notes on the following : 2 + 2

i) Chlorosis

ii) Chelating agents.

OR

c) What do you mean by macro and micronutrients ? Describe the role of nitrogen, potassium and iron in plant nutrition. 8

d) Write short notes on the following : 2 + 2

i) Deficiency disease

ii) Technique of water culture.

3. a) Give an account of mechanism of nutrient uptake in plants. 8

b) Write short notes on the following : 2 + 2

i) Soil as a nutrient reservoir

ii) Channels.

OR

[ 3 ]

c) Enumerate proton ATPase Pump in plants. 8

d) Write short notes on the following : 2 + 2

i) symport

ii) Facilitated diffusion.

4. a) Describe chemical nature and physiological roles of Auxin. 8

b) Write short notes on the following : 2 + 2

i) Richmond and lang effect

ii) Jasmonic acid.

OR

c) Discuss the discovery, chemical structure, occurrence and movement of ethylene. 8

d) Write short notes on the following : 2 + 2

i) General characteristics of plant hormone

ii) Role of gibberellic acid on genetic dwarfism.

5. a) What is photoperiodism ? Describe the different types of plants in response to photoperiod. 8

[ 4 ]

- b) Write short notes on the following : 2 + 2
- i) High irradiance responses (HIR)
  - ii) Application of Vernalization.

OR

- c) Describe the role of phytochrome in photomorphogenesis. 8
- d) Write short notes on the following : 2 + 2
- i) Endogenous seed dormancy
  - ii) Florigen.

**2021**

Full Marks - 60

Time - 3 hours

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Answer *all* questions

**Part-I**

1. Fill in the blanks : 1 × 8
- a) When the anther and stigma mature at the same time, it is known as \_\_\_\_.
  - b) Pollination by bats is termed as \_\_\_\_.
  - c) Allogamy is best favoured by \_\_\_\_.
  - d) Stigma is always rough and sticky in \_\_\_\_ flowers.
  - e) Some unused part of nucellus that is left in the seed is called \_\_\_\_.
  - f) Ubish bodies are associated with the development of \_\_\_\_.
  - g) Proteinaceous endosperm of maize is called \_\_\_\_.
  - h) In angiosperms free nuclear division occurs during \_\_\_\_.

**Part-II**

2. Answer any *eight* of the following :  $1\frac{1}{2} \times 8$

- a) What are the different types of endosperm ?
- b) What do you mean by parthenocarpy ?
- c) What are cleistogamous flowers ?
- d) Name the parts of angiospermic flowers in which development of male and female gametophyte takes place.
- e) What is triple fusion ? Name the nuclei involved in triple fusion.
- f) Why apple is called as a false fruit ?
- g) What do you mean by monoecious and dioecious plants ?
- h) What is meant by monosporic development of female gametophyte ?
- i) Which regions of pistil form fruits and seeds ?
- j) Which is a triploid tissue ? How is the condition achieved in a fertilized ovule ?

**Part-III**

3. Answer any *eight* of the following : 2 × 8
- a) What is common in the function performed by nucellus and cotyledon ?
  - b) Define self compatibility.
  - c) List out the agents of pollination.
  - d) What are the stages of post fertilization in plants ?
  - e) What is heterofertilization ?
  - f) Does apomixis require fertilization and pollination ? Give reasons in support of your answer.
  - g) What are the main layers of a flower ?
  - h) What is homomorhic incompatibility ?
  - i) How does the endosperm of angiosperm differ from that of gymnosperm ?
  - j) Name the three main routes by which pollen tube may enter the ovule.

**Part-IV**

4. a) Explain the process of microsporogenesis in angiosperm. 6

OR

- b) Describe briefly the development of male gametophyte in angiosperms.

5. a) What do you mean by pollination ? Explain the different types of pollination. 6

OR

- b) Write short notes on the following :

- i) Pollen wall
- ii) Cytokinesis.

6. a) With neat labelled diagram describe the parts of a typical angiospermic ovule. 6

OR

- b) Give an illustrated account of the development of the female gametophyte of angiosperms.

7. a) What is apomixis ? How is it different from the normal sexual reproduction ? 6

OR

- b) Describe the structure and development of cellular endosperm.



2021

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Answer *all* questions

**Part-I**

1. Fill in the blanks :

1 × 8

- a) Water potential in plants is generally \_\_\_\_.
- b) Sunken stomata are present in \_\_\_\_.
- c) The membrane that allows some of solute molecules to pass through it and prevent others is called \_\_\_\_.
- d) Root hairs occur in the zone of \_\_\_\_.
- e) The stomata are widely open in \_\_\_\_ light.
- f) The rate of growth is measured by \_\_\_\_.
- g) DPD of a cell with  $OP = 8$  and  $TP = 5$  will be \_\_\_\_.
- h) Deficiency of iron causes \_\_\_\_.

**Part-II**

2. Answer any *eight* of the following :  $1\frac{1}{2} \times 8$
- a) What are the factors affecting the rate of diffusion ?
  - b) What essential role does the root endodermis play during mineral absorption in plants ?
  - c) What plays an important role in controlling the opening of stomata ?
  - d) What is mass or bulk flow ?
  - e) Write the significance of diffusion.
  - f) Define photomorphogenesis.
  - g) Give the name of two synthetic auxins.
  - h) Define vernalisation.
  - i) The period of plant growth is divided into how many phases and state the names ?
  - j) Define photoperiodism ?

[ 3 ]

**Part-III**

3. Answer any *eight* of the following : 2 × 8

- a) Explain the term Osmotic pressure.
- b) What are the plant hormones and their main groups ?
- c) Differentiate between vernalisation and senescence.
- d) Explain the laws of Osmosis.
- e) What is imbibition ? Give two examples of imbibition.
- f) Write the significance of transpiration.
- g) Write applications of synthetic Auxins.
- h) Mention commercial applications of Gibberellins.
- i) List three physiological processes in plants that are affected by light.
- j) List out the factors affecting plant growth.

**Part-IV**

4. a) Define water potential. Describe its components and their interrelationships in plant cells. 6

OR

- b) Describe the mechanism for absorption of water in plants. Add a note on two pathways of water across the root cells.

5. a) Describe the mechanism of mineral ion uptake by plants. 6

OR

- b) Define macronutrients. List out the source, role and deficiency symptoms of nitrogen and phosphorus.

6. a) What is plant growth? Describe the characteristic features and different phases of plant growth. 6

OR

- b) Give an account of physiological role and applications of Auxin.

7. a) Describe in brief about the distribution, chemical nature and functions of Cytokinin. 6

OR

- b) Define seed dormancy. Explain the methods of breaking seed dormancy

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Answer *all* questions.

**Part-I**

1. Fill in the blanks : 1 × 8
- a) The axenic culture is a \_\_\_\_.
  - b) To obtain virus free clonal plants, which part of the plant is cultured.
  - c) Vavilov's centre of origin of crop plants is located in the \_\_\_\_.
  - d) Which plant is introduced from the old world to the new world ?
  - e) Black pepper the dried unripe berries of \_\_\_\_ is considered to be the king of Indian spices.
  - f) Coffee and tea are \_\_\_\_ beverages.
  - g) Ground nut is usually raised as a \_\_\_\_ crop, shown from April to July.
  - h) The cotton fibre from cotton plant is obtained from \_\_\_\_.

**Part-II**

2. Answer any *eight* of the following :  $1\frac{1}{2} \times 8$

- a) Name the plant part from which palm oil is extracted.
- b) What are essential oils ?
- c) Name two important surface fibres of commercial importance are obtained from plants.
- d) Name three species of *Gossypium* from which cotton fibre is obtained.
- e) Name a spice, which is obtained from the bark. Write the botanical name and family of this plant.
- f) Name the main centres of coffee plantation in India.
- g) Write the botanical name and family of wheat.
- h) Define hybrids.
- i) Expand RAPD and RFLP.
- j) Define micropropagation.

[ 3 ]

### Part-III

3. Answer any *eight* of the following : 2 × 8

- a) Write names of four economically important plants introduced into India.
- b) Name five plant products which earn foreign exchange for our country.
- c) Mention the other uses of wheat other than the grains being used as a staple food.
- d) Name the important improved varieties of wheat.
- e) How would you distinguish an essential oil from fatty oil ?
- f) Write about the source and economic importance of black pepper.
- g) What is the basic difference between the fermentated beverages and distilled beverages ?
- h) Define protoplast culture.
- i) List the factors affecting androgenesis.
- j) Write the most frequently used staining methods for checking protoplast viability.

**Part-IV**

4. a) Describe the various centres of the origin of cultivated plants given by Vavilov. What was the basis of his theory. 6

OR

- b) What are cereals and to which family do they generally belong? Write Botanical names of any five cereals.

5. a) Write source, extraction and use of groundnut oil. 6

OR

- b) Which spice is termed as the king of spices? Give its Family, Botanical name and Cultivation.

6. a) What is DNA finger printing? Mention its process and application. 6

OR

- b) Give Botanical names of four fibre yielding plants belonging to different genera. State the method of extraction and use of the fibre from each of them. 6

7. a) Define haploid culture. State different types of haploid culture methods. 6

OR

- b) What is the purpose of embryo culture? Mention the different types of embryo culture.



2021

Full Marks - 60

Time - 3 hours

The figures in the right-hand margin indicate marks

Answer *all* questions

**Part-I**

1. Fill in the blanks : 1 × 8
- a) Number of biogeographical regions of India is \_\_\_\_.
  - b) MAB programme of UNESCO was launched in \_\_\_\_.
  - c) Earth Summit of Rio de Janeiro (1992) resulted in \_\_\_\_.
  - d) Biodiversity Act of India was passed by the Parliament in the year \_\_\_\_.
  - e) When porous soil is saturated with water of certain level below soil surface, it is called as \_\_\_\_.
  - f) Forest constitute \_\_\_\_ % of global biomass.
  - g) Percentage of methane present in biogas is \_\_\_\_.
  - h) Compost is made using \_\_\_\_.

**Part-II**

2. Answer any *eight* of the following :  $1\frac{1}{2} \times 8$

- a) What is mulching ?
- b) What is beta diversity ?
- c) What is gene banks ?
- d) Expand IPR and CBD.
- e) Define Environmental Impact Assessment (EIA).
- f) What is deforestation ?
- g) What are biological realms ?
- h) Write tidal energy.
- i) What is inexhaustible resources ?
- j) Define bioprospecting.

**Part-III**

3. Answer any *eight* of the following :  $2 \times 8$

- a) Explain the importance of water as a resource.
- b) Write the components of EIA.
- c) What do you understand by non-renewable sources of energy ?
- d) What are permanent streams ?

[ 3 ]

- e) What are reservoirs ?
- f) Write about the Major Forest Products (MFPs).
- g) Explain geothermal energy.
- h) What are the objectives of EIA ?
- i) What is the relationship between EIA and sustainable development ?
- j) What are the three pillars of sustainability ?

#### Part-IV

4. a) What is sustainability ? Discuss why sustainability is important ? 6

OR

- b) What is rainwater harvesting ? Mention the advantages and disadvantages of rainwater harvesting.

5. a) What are natural resources ? Describe their type and management. 6

OR

- b) What is bioprospecting ? Describe the problems with the current approach to bioprospecting.

[ 4 ]

6. a) Define biodiversity. Describe the strategies of biodiversity conservation. 6

OR

- b) Define renewable energy. Describe the ways to get renewable energy.

7. a) Make a critical estimate of Environmental Impact Assessment System 6

OR

- b) What is waste management ? Describe in detail about the principles of waste management.

2021

Full Marks - 60

Time - 3 hours

The figures in the right-hand margin indicate marks

Answer *all* questions

**Part-I**

1. Answer the following : 1 × 8
- a) Which of the following is used to visualize line cells
- i) SEM
  - ii) TEM
  - iii) Phase contrast Microscope
  - iv) All of these
- b) All the following are components of compound microscope except.
- i) stage chips
  - ii) fine adjustment
  - iii) electron gun
  - iv) Binocular eye piece
- c) The resolving power of unaided human eye is :
- i) 1cm
  - ii) 100 um
  - iii) 200 nm
  - iv) 400 nm
- d) The refractive index of air is :
- i) 0.5
  - ii) 0.75
  - iii) 100
  - iv) 125
- e) The particle sedimentation velocity increases with :
- i) increasing viscosity
  - ii) decreasing difference in density between the two phases

- iii) increasing diameter
  - iv) All of the above
- f) What is the principle of centrifugation ?
- i) Size reduction principle
  - ii) Filtration principle
  - iii) Evaporation principle
  - iv) Sedimentation principle.
- g) Chromatography is a physical method that is used to separate \_\_\_\_.
- i) Simple mixtures      ii) Complex mixtures
  - iii) Viscous mixtures      iv) Metals
- h) Chromatography with solid stationary phase is called \_\_\_\_.
- i) Circle chromatography
  - ii) Square Chromatography
  - iii) Solid chromatography
  - iv) Adsorption chromatography

### Part-II

2. Answer any *eight* of the following : 1½ × 8
- a) Write applications of column chromatography.
  - b) What is the role of SDS in SDS-PAGE ?
  - c) What are the uses of isotopes in agriculture ?
  - d) What is Faraday's cup ?
  - e) What is freeze fracture ?
  - f) Write mean deviation.

[ 3 ]

- g) Write coefficient of dispersion.
- h) What do you mean by discontinuous system of electrophoresis ?
- i) In one sentence write the basis of mass spectrometers.
- j) How absorbance is related to transmittance.

### Part-III

3. Answer any *eight* of the following : 2 × 8
- a) What do you mean by autoradiography ?
  - b) Write affinity of chromatography.
  - c) State the relationship between centrifugal field, radius of the roter and rpm.
  - d) State the advantages of sucrose use in density gradient centrifugation.
  - e) How constrast in image increased in SEM ?
  - f) Name the chemicals used for fixation of samples of EMS.
  - g) Write the components of transmission electron microscope.
  - h) Write advantages of SDS-PAGE.
  - i) Distinguish between mean deviation and standard deviation.
  - j) Mention the relationship between mean, median and mode.

**Part-IV**

4. a) What is the principle of flow cytometry ?  
Discuss its application. 6

OR

- b) What is fluorescent microscopy ? Discuss the principle and application of fluorescent microscopy.

5. a) Give an account of differential centrifugation and its application. 6

OR

- b) What is spectrophotometry ? Discuss the application of spectrophotometry in biological research.

6. a) Give an account of structure and types of centrifuges. 6

OR

- b) Discuss in detail about principles and method of SDS-PAGE.

7. a) Describe biological sample preparation steps for viewing in TEM. 6

OR

- b) In case of snapdragon we observed 70 red flowered and 27 pink flowered plants. What is your comment after chi-square analysis ?