

2015

## BOTANY — HONOURS

## FIFTH PAPER

*Full Marks – 100**The figures in the margin indicate full marks**Candidates are required to give their answers in their own words as far as practicable*

## GROUP – A

1. Answer the following in few words :
- |  |   |
|--|---|
| (a) Comment on the dual activity of 'Rubisco'.                                   | 2 |
| (b) What is P/O ratio ?  | 1 |
| (c) Under what circumstances RQ of plant tissue may become zero and infinity ?   | 2 |
| (d) What is embolism ? Does it affect water transport in plants ?                | 2 |
| (e) Mention the mitochondrial reaction of photorespiration.                      | 2 |
| (f) Name the plant and plant part from where Brassinosteroid was first reported. | 1 |
2. Answer *any two* of the following :
- |   |     |
|---|-----|
| (a) What is water potential ? Do you think that water potential gradient is the only driving force for osmosis ? Justify your answer. | 2+3 |
| (b) Explain in brief the amphibolic roles of TCA cycle.   | 5   |
| (c) Discuss briefly the role of heat shock proteins to encounter the effect of high temperature stress in plants.                     | 5   |
| (d) Describe the process of nitrate assimilation in plants.   | 5   |
3. Answer *any two* of the following :
- |   |         |
|---|---------|
| (a) Give the biochemical reactions of $\beta$ -oxidation of fatty acids. Why is it called $\beta$ -oxidation ? How many ATP molecules will be produced after complete oxidation of a molecule of palmitic acid ( $C_{16}$ ) ? State the significance of $\beta$ -oxidation of fatty acid. | 8+2+2+3 |
| (b) What do you understand by photoperiodic induction ? What is the site of perception of the photoperiodic stimulus ? Comment on the importance of dark period and discuss the role of phytochrome in flower-initiation.   | 2+2+4+7 |
| (c) Write down the tryptophan dependent biosynthesis of IAA. With suitable sketches show the immediate effect of auxin in extension growth is mediated by activating proton pumps in plasma membrane. Mention a physiological process where GA and ABA act antagonistically.              | 5+8+2   |

[Turn Over]

- (d) What do you mean by phloem loading and unloading ? Describe the mechanism of translocation through phloem with special reference to 'mass-flow-hypothesis'. State the merits and demerits of this hypothesis. 2+10+3

### GROUP - B

4. Answer the following in few words :
- (a) What is Gibbs free energy ? 2
  - (b) Define symport and antiport. 2
  - (c) Two proteins on hydrolysis gave identical amino acids but still they are different proteins. Why ? 2
  - (d) What is PUFA ? Cite an example. 2
  - (e) Why the pH of pure water is 7 ? 1
  - (f) What is the importance of Handerson-Hasselbalch equation ? 1
5. Answer *any two* of the following :
- (a) Describe how you would determine whether an inhibition of an enzyme reaction is a competitive or non-competitive one. Draw a graph to illustrate your answer. 5
  - (b) What are epimers ? Cite example. State the difference between a D-glucose and a d-glucose. 2+1+2
  - (c) Give a brief account of non-genetic RNA. 5
  - (d) Classify amino acids on the basis of their side chains (R-group). 5
6. Answer *any one* of the following :
- (a) What do you mean by phosphorylation ? Distinguish between photophosphorylation and oxidative phosphorylation. In the light of chemiosmotic model describe in brief the mechanism of ATP synthesis in chloroplast. 1+4+10
  - (b) Mention the basic features of a signal transduction pathway and briefly explain the G-protein and Calcium-mediated signal transduction cascade. 5+5+5
7. Mention the source plants, parts used and uses of the following pharmacologically active constituents : 3 × 5
- Vinblastin, Catechin, Gingerol, Quinine and Digitoxin.
- Or*
- (a) Write a brief note on protective action of secondary metabolites against pathogenic microbes and herbivores. 7
  - (b) Write down chemical and pharmacological classification of drugs. 8

2018  
**BOTANY — HONOURS**  
**Fifth Paper**  
**Full Marks – 100**

*The figures in the margin indicate full marks*  
*Candidates are required to give their answers in their own words as far as practicable*

**Group – A**

1. Answer the following in few words :
  - (a) What is osmotic potential ? Mention its components. 2
  - (b) When photosynthesizing plants are deprived of light, PGA contents increase — Why ? 2
  - (c) Point out the biological significance of carotenoid pigments. 2
  - (d) Why all plant growth regulators are not termed phytohormones ? 2
  - (e) What do you mean by soil-plant-atmosphere-continuum (SPAC) concept ? 1
  - (f) Name one plant growth substance which is used as a herbicide. 1
  
2. Answer *any two* of the following :
  - (a) Briefly describe the CO<sub>2</sub> concentrating mechanism in CAM plants. 5
  - (b) What do you mean by stratification and scarification methods of breaking seed dormancy ? 5
  - (c) Describe the role of Brassinosteroids as plant growth-regulator. 5
  - (d) Write a note on osmoregulation in plants under various stress conditions studied by you. 5
  
3. Answer *any two* of the following :
  - (a) Mention the dual role of RuBisCO with chemical reactions. Write down the biochemical steps involved in photorespiration along with their locale. Comment on positive and negative impact of photorespiration in plants. 4+8+3
  - (b) Describe the pathway for formation of pyruvic acid in an aerobic cell. Why EMP pathway is called an anabolic pathway ? Write the substrate level phosphorylation step of TCA cycle. 10+3+2
  - (c) Write down the process of IAA biosynthesis from tryptophan with the help of chemical structure and flow chart. Explain the effect of auxin on extension growth mediated by activating proton pump in plasma membrane. Mention a physiological process where auxin and cytokinin play an antagonistic role. 5+8+2
  - (d) What is nitrification and denitrification ? Describe the reactions of nitrate assimilation. Outline the process of synthesis of amino acids by GS-GOGAT enzyme system. 4+5+6

[Turn Over]

## Group – B

4. Answer the following in few words : 2
- (a) Define Gibb's free energy. 2
- (b) Name one reducing disaccharide and one non-reducing disaccharide. 2
- (c) What do you understand when a fatty acid is abbreviated as 20:2 $\Delta$ 9, 12 ? 2
- (d) What do you mean by antiparallel feature of DNA helix ? 2
- (e) What is the utility of Henderson Hasselbach equation ? 1
- (f) What are non-essential amino acids ? 1
5. Answer *any two* of the following :
- (a) What are epimers ? Cite example. State the difference between a D-glucose and a d-glucose. 2+1+2
- (b) Calculate  $V_{max}$  of an enzymatic reaction from the following data using Michaelis–Menten equation —
- $K_m = 1 \text{ m mole L}^{-1}$
- $[S_0] = 0.5 \text{ m mole L}^{-1}$
- $V_0 = 50 \text{ m mole L}^{-1} \text{ min}^{-1}$ . 5
- (c) Discuss the role of  $\text{Ca}^{2+}$  as second messenger with reference to signal transduction pathway. 5
- (d) Define free radicals with examples. Mention their significant roles in plant metabolism. 2+3
6. Answer *any one* of the following :
- (a) What is peptide bond ? Classify amino acids on the basis of their R-groups. Name and write down the molecular structure of an aromatic amino acid. Give a brief note on secondary structure of protein. 1+6+2+6
- (b) What is chemiosmotic theory ? State with the help of diagrams how this theory can explain the generation of ATP in oxidative and photo-phosphorylation. 3+6+6
7. Mention the source plants, parts used and uses of the following pharmacologically active constituents : 3×5
- Diosgenin, Reserpine, Strychnine, Curcuminoids and Catechin.
- Or*
- Write short notes on : 5×3
- (a) Importance of pharmacognosy in modern medicine.
- (b) Classification of drugs on the basis of chemical constituents and therapeutic effects with examples.
- (c) Interrelationship of basic metabolic pathways leading to biosynthesis of secondary metabolites (outlines only).

2018  
**BOTANY — HONOURS**  
 Sixth Paper  
 Full Marks – 100

*The figures in the margin indicate full marks*  
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**Module – XI**  
**(50 Marks)**

1. Answer the following questions :
- |   |   |
|---|---|
| (a) What is the full form of SCAR?                                      | 1 |
| (b) What is NOR? State its function.                                    | 2 |
| (c) How does apoptosis differ from necrosis?                            | 2 |
| (d) State two important factors that affect Hardy-Weinberg equilibrium. | 2 |
| (e) Define goodness of fit. Write the formula of Chi-square.            | 2 |
| (f) Define cytoplasmic male sterility.                                  | 1 |

2. Discuss with labelled sketches the role of MPF in cell-cycle regulation in yeast. Briefly state the controlling mechanisms of different check points during interphase. Write a brief note on the packaging of DNA in eukaryotic chromosome on the basis of nucleosome concept.
- 6+3+6

*Or*

Write short notes on the following : 5×3

- |   |  |
|---|--|
| (a) Structural organization of telomere   |  |
| (b) Chloroplast DNA                       |  |
| (c) Karyotype concept and its parameters. |  |
3. Answer *any two* of the following :
- |  |     |
|--|-----|
| (a) What is hybrid vigour? Explain the genetic basis of heterosis. | 1+4 |
| (b) Explain the laws of probability with examples.                 | 5   |
| (c) Distinguish between mass selection and pure-line selection.    | 5   |
| (d) Find the mean and standard deviation of the following data :   | 5   |

Length of seeding(cm)	10	11	12	13	14	15	16
Frequency	2	7	11	15	10	4	1

[Turn Over]

4. State the role of osmoticum in protoplast isolation. Explain the different methods of protoplast fusion. What is cybrid? Mention the different applications of somatic hybrid.

3+5+2+5

Or

Answer the following :

5×3

- (a) Distinguish between organogenesis and somatic embryogenesis.  
 (b) Explain briefly the different stages involved in micropropagation technique.  
 (c) Enumerate briefly the different direct gene transfer methods in plant transformation.

### Module – XII

(50 Marks)

5. Answer the following questions :

- (a) Differentiate between dominance and epistasis. 2  
 (b) What is homoeotic gene? Give an example. 2  
 (c) Distinguish between genomics and proteomics. 2  
 (d) What is TATA box? 1  
 (e) Name the enzyme required for PCR and mention its source. 2  
 (f) Give an example of reporter gene. 1

6. Discuss in brief *any two* of the following :

5×2

- (a) Processing of mRNA in eukaryotes.  
 (b) Meiotic behaviour of paracentric and pericentric inversions with suitable examples.  
 (c) Ac-Ds system in maize.  
 (d) Comparison between genomic and cDNA library preparations.

7. Answer *any two* of the following :

- (a) Explain amino-acylation of tRNA. Describe with labelled sketches the different steps in prokaryotic translation process. 3+12  
 (b) Mention the different properties of genetic code. Discuss the triplet-binding technique for deciphering the genetic code. Explain Wobble hypothesis. 6+5+4  
 (c) Distinguish between euploidy and aneuploidy. State the different types of aneuploidy, their origin and meiotic behaviour. Explain the importance of amphidiploidy in the origin of *one* crop species. 2+10+3

(d) A cross was made between purple leaf (pl), glossy seeding (gl), dwarf (t) variety and wild type.  $F_1$  plants were test-crossed and the following proportions were obtained when 3000 plants were counted :

+++ -875; pl gl t -889; pl ++ -102; +gl t -109; pl+t -496; +gl+ -506; ++t -12; pl gl + -11.

- (i) Calculate the map distance and find out the gene order.  
 (ii) Determine the coefficient of coincidence and interference.

(8+2)+(3+2)

2019

## BOTANY — HONOURS

Fifth Paper

Full Marks : 100

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

## Group – A

1. Answer the following in few words :

- |  |   |
|--|---|
| (a) Why water potential of a cell is always negative?                | 1 |
| (b) What is RQ? Give its significance.                               | 2 |
| (c) What is embolism? Does it affect water transport in plants?      | 2 |
| (d) What do you mean by "triple response" of ethylene?               | 2 |
| (e) Write the reaction catalyzed by aldolase enzyme in Calvin cycle. | 2 |
| (f) What is critical day length?                                     | 1 |

2. Answer *any two* of the following :

- |   |     |
|---|-----|
| (a) Critically evaluate the Mass-flow hypothesis of phloem transport.                                     | 5   |
| (b) Describe the biochemical reactions for conversion of Pyruvic acid to Acetyl CoA.                      | 5   |
| (c) Discuss the role of heat shock proteins to encounter the effect of high temperature stress in plants. | 5   |
| (d) Describe the process of photolysis of water in chloroplast. Mention its significance.                 | 4+1 |

3. Answer *any two* of the following :

- |   |             |
|---|-------------|
| (a) What are natural and synthetic plant growth regulators? Give examples. Discuss the physiological role of cytokinin in cell division, senescence and organogenesis. Describe the role of polyamines as plant growth-regulator.   | (2+2)+6+5   |
| (b) What is chloroplast dimorphism in C <sub>4</sub> plants? Schematically represent the NADP-ME type and PEP-CK type of CO <sub>2</sub> concentrating mechanism in C <sub>4</sub> plants. Compare C <sub>4</sub> plants with CAM plants. What do you mean by CAM-idling? | 2+(4+4)+3+2 |
| (c) What is the difference between dormancy and quiescence? Discuss various methods of breaking seed dormancy. Briefly describe the biochemical changes associated with the process of seed germination.  | 3+5+7       |
| (d) Differentiate between symbiotic and non-symbiotic dinitrogen fixation. Elucidate the biochemistry of dinitrogen fixation with reference to nitrogenase complex in legumes. Discuss the role of leghaemoglobin in biological nitrogen fixation.                        | 4+8+3       |

Please Turn Over

## Group - B

4. Answer the following in few words :
- |   |   |
|---|---|
| (a) Define symport and antiport.                    | 2 |
| (b) Define free radicals citing examples.           | 2 |
| (c) What is chemiosmosis? Mention its significance. | 2 |
| (d) What is isoelectric point?                      | 1 |
| (e) What is a buffer solution? Give an example.     | 2 |
| (f) Name an amino acid that lack a chiral-centre.   | 1 |
5. Answer *any two* of the following :
- |   |       |
|---|-------|
| (a) What do you mean by a dextrorotatory compound? What is a racemic mixture? Write down the structure of a homopolysaccharide found in plants. | 2+1+2 |
| (b) Classify amino acids on the basis of their side chains (R-group).   | 5     |
| (c) What relationship exists between $K_m$ and $[S]$ when an enzyme catalyzed reaction proceeds at 40% $V_{max}$ ?                              | 5     |
| (d) Point out the differences between mRNA and hnRNA. Distinguish between ribonucleotides and deoxyribonucleotides.                             | 3+2   |
6. Answer *any one* of the following :
- |  |             |
|--|-------------|
| (a) Explain how fatty acid and glycerol molecule combine to form a lipid molecule. Differentiate between a simple lipid and a compound lipid. Write down the structure of phospholipid and glycolipid molecule. With suitable example explain saturated and unsaturated fatty acids. What is PUFA? When the carbon skeleton of a fatty acid is 18:1 ( $\Delta^9$ ) — write down its structure. | 2+2+4+4+1+2 |
| (b) (i) Briefly discuss the structure and properties of water molecule.  |             |
| (ii) What is G-protein? Mention the role of G-protein in signal transduction.  |             |
| (iii) Classify enzyme according to IUBMB at the level of classes only with one example from each class.  | 5+5+5       |
7. Mention the source plants, parts used and uses of the following pharmacologically active compounds :  
Gingerol, Digitoxin, Vinblastin, Quinine and Catechin.
- 3×5
- Or,*
- Write short notes on :
- 5×3
- |  |  |
|--|--|
| (a) Biological evaluation of drugs.  |  |
| (b) Importance of alkaloids in the defense of plants against pathogenic microbes and herbivores.         |  |
| (c) Classification of drugs on the basis of chemical constituents and therapeutic effects with examples. |  |

2019

## BOTANY — HONOURS

Sixth Paper

Full Marks : 100

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

Module – XI

(Marks : 50)

1. Answer the following questions :

- (a) State two salient features of telomeric DNA. 2
- (b) Define emasculation. 1
- (c) What is a ribozyme? Give an example. 2
- (d) What is the function of Nuclear Lamina? 1
- (e) State the structure of nucleosome octamer. What is the function of H1 histone protein? 2
- (f) State the overdominance theory of heterosis. 2

2. Describe the ultrastructural features of nucleolus. Elucidate briefly the different steps of ribosome biogenesis. Give a brief idea of apoptosis. 4+8+3

*Or,*

Write short notes on the following : 5×3

- (a) Chromosome movement in anaphase.
- (b) SET Theory and the origin of eukaryotic cell.
- (c) Importance of interphase in cell-cycle progression in an eukaryote cell.

3. Answer *any two* of the following :

- (a) Describe the different devices adopted for maintaining the germplasm. 5
- (b) What is meant by the term male sterility? Explain in brief the different types of male sterility. 1+4
- (c) Calculate the mean, standard deviation and standard error of grain lengths of a variety of rice :

Grain length (mm)	9–11	12–14	15–17	18–20	
No. of grains	8	13	17	12	1+2+2

Please Turn Over

- (d) (i) In a population having completely dominant gene, 98 out of 200 individuals showed recessive phenotype. Using Hardy-Weinberg's equation, determine the percentage of Heterozygotes in the population. 3+2
- (ii) What is Student's *t* test? 3+2
4. Discuss sequentially the steps of T-DNA transfer process from *Agrobacterium* cell to plant nuclear genome. Write a brief note on achievements of gene transfer technology in crop improvement citing two examples. 10+2½+2½

Or,

Answer the following :

- (a) Differentiate between zygotic embryo and somatic embryo with examples. 5
- (b) Write a short note on the different techniques required for complete aseptic manipulations in plant cell and tissue culture. 5
- (c) Explain any method of androgenic haploid production in culture. Why pollen culture is desirable in haploid production? 3+2

### Module – XII

(Marks : 50)

5. Answer the following questions :
- (a) State the central dogma of living organisms. 1
- (b) Define complete and incomplete linkage. 2
- (c) What is an overlapping gene? Give one example. 2
- (d) What is C-DNA library? 1
- (e) What is a Homeologous chromosome? Give an example of an economically important amphidiploid. 2
- (f) Give an example of a restriction endonuclease. What are blunt cut and stagger cut? 2
6. Discuss in brief *any two* of the following : 5×2
- (a) One-gene-one polypeptide hypothesis.
- (b) Cytological basis of crossing-over.
- (c) Experimental evidence in favour of semi-conservative replication of DNA in prokaryotes.
- (d) ABC model of floral organogenesis in *Arabidopsis* sp.
7. Answer *any two* of the following :
- (a) Describe the structure of lac-operon. How does lactose trigger the co-ordinated induction of the synthesis of  $\beta$ -galactosidase, permease and transacetylase? Why does the synthesis of these enzymes not occur when glucose is also in the medium? 3+6+6

- (b) State the differences between translocation and crossing-over. Explain the *origin* of reciprocal translocation and the *meiotic behaviour* of a translocation heterozygote and its effect on pollen viability. 2+3+8+2
- (c) In *Solanum lycopersicon*, three linked genes are mottled (m) or normal (M) leaf; smooth (p) or pubescent (P) epidermis and purple (Aw) or green (aw) stem.

Individual heterozygous for all these genes were test-crossed and the following results were obtained :

Normal, smooth, purple	18
Mottled, pubescent, green	15
Normal, smooth, green	180
Mottled, pubescent, purple	187
Normal, pubescent, purple	1880
Mottled, smooth, green	1903
Mottled, smooth, purple	400
Normal, pubescent, green	417

Work out the linkage map showing the order and the distances between the three loci. Calculate the coefficient of coincidence and interference. 2+10+3

- (d) What is tautomerism? Briefly discuss its role in causing point-mutation. Compare the mutagenic effects of an alkylating agent and a base analogue. What is photoreactivation? 2+3+8+2

2020

## BOTANY — HONOURS

## Fifth Paper

Full Marks : 100

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

## Group – A

1. Answer the following in few words :
- |  |   |
|--|---|
| (a) What is P/O ratio?   | 1 |
| (b) What do you mean by soil-plant-atmosphere-continuum (SPAC)?                  | 2 |
| (c) What is osmotic potential? Mention its components.                           | 2 |
| (d) Give the chemical structure of IAA.  | 2 |
| (e) Write down the specific reaction of glycolysis which is oxidative in nature. | 2 |
| (f) What is scarification?   | 1 |
2. Answer *any one* of the following : 10
- |   |  |
|---|--|
| (a) Briefly describe the role of blue light in stomatal movement.   |  |
| (b) Discuss the role of GS and GOGAT in ammonia assimilation.   |  |
| (c) Describe how PSI and PSII cooperate in producing NADPH and ATP in the light reaction of photosynthesis. |  |
| (d) Briefly describe the process of phloem loading and unloading with illustrations.                        |  |
3. Answer *any one* of the following :
- |   |          |
|---|----------|
| (a) Why photorespiration is also called peroxisomal respiration? Diagrammatically represent the actual site of synthesis, oxidation and decarboxylation of the photorespiratory substrate with their enzymes. Is the process totally wasteful to plants? — Explain with reason. | 4+20+6   |
| (b) Define stress. What is an osmolyte? Discuss various mechanisms present in plants to overcome water stress. What is the difference between Eu-halophytes and halophytic plants?  | 2+3+20+5 |
| (c) Write notes on :  | 10×3     |
| (i) Role of ethylene in fruit ripening  |          |
| (ii) Role of GA in $\alpha$ -amylase production in aleurone cells   |          |
| (iii) Role of brassinosteroids as plant growth regulator.   |          |

Please Turn Over

- (d) Why oxidative pentose phosphate pathway is called a shunt pathway? Schematically describe the pathway giving structures of substrates, products and name the enzymes involved in each step. Mention the significance of this pathway. 4+20+6

### Group – B

4. Answer the following in few words :

- (a) What are the uncommon bases in DNA and RNA? 2  
 (b) Define Gibb's free energy. 2  
 (c) What are Zwitterious? 1  
 (d) Write down the chemical structure of a pyrimidine nitrogen base. 2  
 (e) Name an amino acid that lacks a chiral centre. 1  
 (f) Distinguish between lyase and hydrolase type of enzymes. 2

5. Answer **any one** of the following :

- (a) Point out the differences between aldose sugar and a ketose sugar with example. What is stereoisomerism? 6+4  
 (b) Calculate the  $V_{\max}$  of an enzymatic reaction from the following data using Michaelis-Menten equation : 10

$$K_m = 3.0 \text{ m mol L}^{-1}$$

$$[S_o] = 1.0 \text{ m mol L}^{-1}$$

$$V_o = 70 \mu \text{ mol L}^{-1} \text{ min}^{-1}$$

- (c) Write down the biochemical reactions of  $\beta$ -oxidation. 10  
 (d) What is redox potential? Explain it with the help of electrochemical gradient. 4+6

6. Write **any one** of the following :

- (a) What are primary and higher order structures of protein? Write down the various structural levels of proteins indicating the chemical bonds involved in protein folding. How are the two amino acids joined to form a peptide? What are essential and non-essential amino acids? 4+16+6+4  
 (b) What do you mean by phosphorylation? Distinguish between photophosphorylation and oxidative phosphorylation. In the light of chemiosmotic model describe in brief the mechanism of ATP synthesis in mitochondria. 2+8+20  
 (c) Mention the source plants, parts used and uses of the following pharmacologically active compounds : Reserpine, Strychnine, Curcuminoids, Catechin and Diosgenin. 6×5  
 (d) Write short notes on : 10×3  
 (i) Importance of flavonoids in the defense of plants against pathogenic microbes and herbivores.  
 (ii) Biological evaluation of drugs.  
 (iii) Give an outline of interrelationship of basic metabolic pathways with secondary metabolite biosynthesis.

**2020**

**BOTANY — HONOURS**

**Sixth Paper**

**Full Marks : 100**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Module - XI**

**(Marks : 50)**

1. Answer the following questions :

- |   |   |
|---|---|
| (a) What is MPF? State its functions.                                     | 2 |
| (b) What is meant by an asymmetrical karyotype?                           | 1 |
| (c) What is NOR? What is its function?                                    | 2 |
| (d) What do you mean by endosymbiotic theory? Give an example in support. | 2 |
| (e) What are the factors that affect Hardy-Weinberg equilibrium?          | 2 |
| (f) What is Null Hypothesis?  | 1 |

2. Answer **any one** of the following :

- |   |             |
|---|-------------|
| (a) (i) Describe the structure of nucleus of an eukaryotic cell with special emphasis on the nuclear envelope, nuclear lamina and the nuclear pore complex.   |             |
| (ii) Write a brief note on the packaging of DNA on the basis of nucleosome concept.   | 18+12       |
| (b) Write short notes on the following :  | 10×3        |
| (i) Importance of different checkpoints in cell-cycle progression with examples.  |             |
| (ii) Genetic material of the organelle involved in cms.   |             |
| (iii) Centromere and Kinetochore.   |             |
| (c) What is Somatic hybridization? Discuss, in brief, the methods of somatic hybrid production. Describe the different fusion products obtained after somatic hybridization in culture. Define osmoticum with example and state its role. | 2+10+10+4+4 |

**Please Turn Over**

(d) Answer the following :

- (i) Write the essential components of plant tissue culture medium. 10
- (ii) Define artificial seed. Explain the types of artificial seeds and state its importance. 2+6+2
- (iii) Explain the method of induction of callus and state its importance. 8+2

3. Answer *any one* of the following :

(a) Calculate the mean, standard deviation and standard error from the following observations : 10

Observation No.	Increase in dry weight (in mg)
1	4.25
2	4.20
3	4.15
4	3.35
5	3.25
6	4.70
7	3.25
8	3.75
9	3.70
10	3.90

- (b) What is Hybrid Vigour? Explain the genetic basis of Heterosis. 2+8
- (c) Discuss the merits and demerits of mass selection and pure-line selection. What is inbreeding depression? 8+2
- (d) What is back cross method? What are its applications in plant breeding? 4+6

### Module - XII

(Marks : 50)

4. Answer the following questions :

- (a) Give an example of a Base analogue. Why is it so called? 1+1
- (b) What is Homeotic gene? Give an example. 2
- (c) What is YAC? 1
- (d) What is an operon? Give one example. 2
- (e) Cite one example of a marker gene. 1
- (f) Why does the lagging strand of DNA replicate discontinuously? 2

5. Answer *any one* of the following :

- (a) Discuss, in brief, the polygenic inheritance in plants. 10
- (b) Discuss, in brief, the molecular mechanism of mutations caused by 5-BU and  $\text{HNO}_2$ . 5×2
- (c) Draw and discuss the molecular mechanism of crossing over following single-strand nick. 10
- (d) Discuss the meiotic behaviours of pericentric and paracentric inversions. Which one, according to you, is more fatal and why? 8+2

6. Answer *any one* of the following :

- (a) Define gene cloning and enumerate the properties of an ideal gene cloning vector. Give an outline of gene cloning technique. What are ORFaus genes? Write a short note on different types of proteomics. 10+10+2+8
- (b) What is meant by aminoacylation of tRNA? Discuss the mechanism of translation in prokaryotes with neat diagrams. 6+24
- (c) (i) What do you mean by Pseudogene? Explain the test of complementation in rII locus.  
(ii) Distinguish between Dominant and Recessive epistasis with examples. How do they differ from Mendelian inheritance? (12+2)+(12+4)
- (d) A cross was made between purple leaf (pl), glossy seedling (g), dwarf variety (t) and wild (+++) type.  $F_1$  plants were test-crossed and following proportions were obtained when a sample of 1000 plants were counted :

Wild	310
Purple leaf, Glossy seedling, Dwarf	305
Purple leaf	140
Glossy seedling, Dwarf	145
Purple leaf, Dwarf	42
Glossy seedling	43
Dwarf	9
Purple leaf, Glossy seedling	6

Draw a linkage map showing the order and distance of three genes. Calculate the coefficient of coincidence and interference. 20+6+4

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